

Advancing kiln maintenance

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While gazing into the long dark tunnel of a cement kiln, many production managers find themselves contemplating the refractory maintenance process. They are left with many issues to consider. Bricking Solutions offers advice for a number of problems when maintaining refractories.

Who should carry out the installation, plant personnel or a subcontractor? What type of installation method should be used? Where should I begin? What is the most efficient method? Simultaneously, the plant managers are considering the issue of safety and cost efficiency: what is the safest, most cost-effective method I can employ?

With much to consider prior to and during outages, there have been many changes in the way this type of work is being implemented, but with a continued emphasis on safety first, quality second, and finally production rates.

Even in these modern times, many plants still use the decade-old methods, which have proved to be inefficient and unsafe. Kiln maintenance isn't rocket science, but with today's technology there are many modern solutions that can be utilised to ensure that kiln repairs and maintenance can be safe, efficient and cost-effective.

Material

The first step to modern kiln maintenance equipment is the choice of material. Products fabricated out of 6061 T6 aircraft aluminium are half the weight of a steel version, but just as strong. Using this high-quality aluminium increases both safety and efficiency.

Kiln access

When considering kiln maintenance, access is another issue to consider. Modern custom kiln access ramps can be installed in about 1.5-2 hours in most kilns, with the use of a fork-truck lifting lugs located on the ramp. Using high quality aluminium and modern engineering design, ramps have a 15,000lb/6800kg live-load capacity, with a 3:1 safety factor and allow working demolition equipment to break off the bridge section. The choice is obvious:



Bobcat with Muck-It-Bucket on custom kiln access ramp in Lafarge North America's Seattle Plant

purchasing a safe, lightweight, easy-to-install, aluminium ramp that can be used year after year, realising a return-on-investment in approximately two years.

Large kilns with a big cooler will make the bridge section of a ramp 20ft/6m long, making it too difficult and unsafe for a fork-truck to install without assistance. Many plants continue to use an outdated bridge installation method – overhead electric hoist, along with a forklift and rigging to sling the bridge section across the cooler span into the kiln. However, this method requires one or more access openings in the top of the kiln hood, and it is not the safest method available.

Is there a more modern solution? For kilns with a cooler span over 20ft/6m, a load fixture is the safest and most efficient bridge installation method. The load fixture is a frame with vertically-adjustable horizontal support beams, used to support the bridge section of the ramp, by using cables while it is being extended across the cooler chamber. The frame must be secured to the burn floor and the door frame prior to using.

The bridge section is rolled into place either manually or by using a forklift and guided by the loading fixture. The

load fixture is then used to lower the bridge onto the kiln lip with the cable hoist. The load fixture is also used with ease to raise the bridge section to rotate the kiln when necessary for other repairs to the refractory installation.

Safe kiln inspection

Once access is no longer an issue, the next question many have is how to inspect a kiln for hot spots or if repairs need to be done during an outage? This task necessitates either the removal of coating or working under it (which is very dangerous). However, there is a simple solution – a Safety Inspection Cage fabricated of lightweight, high-quality aluminium reduces the risk of inspecting a kiln during an outage.

The most common safety inspection cage is designed for two workers to carry the cage into the kiln for inspections. With the cage weighing approximately 90kg (200lbs), two shoulder harnesses place the weight on the torso, not their arms, plus a set of flip-up handles is used for balance control. In addition, the cage can be assembled in about 15 minutes and is rated for 113.5kg (250lbs) dropped from 60cm (24in) with a 3:1 safety

factor. A shock-absorbed panel increases safety. Moreover, several cages can be attached together, forming a tunnel through the burn zone. This enables safe access to the upper transition zone for small tear-outs and repairs as the Lafarge Seattle plant has done.

Tear-out

If tear-out is required is there a more effective, safer refractory removal method than the manual jack hammer method. Many plants remain focused on the safety of workers and by use a Brokk de-bricking machine. The remote control robotic demolition machine, electronically-powered without the fumes of a mini-excavator is the safest solution. It has been designed for confined spaces, it is lightweight with an articulated arm to reduce the chances of kiln shell or damaging good brick while still meeting all international safety standards.

This is the perfect solution for the tear-out of old refractory: not only is it safer and less fatiguing for workers, but it will also reduce tear-out time by 50 per cent or more.

With old refractory on the bottom of the kiln, what would be the most efficient way to remove the debris? Since most plants have a couple of skid-steers available, the Muck-it-Bucket was designed for removal of the old refractory. It comes standard with a universal quick-hitch that fits most skid-steers models. It is equipped with a radii bottom matching the curvature of the kiln shell for efficient loading, with a 0.5in/12.7mm T-1 steel,

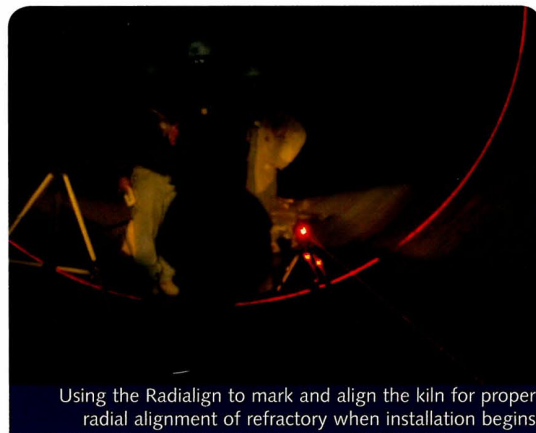
beveled leading edge to increasing life and strength.

St Lawrence Cement shaved 24 hours off its previous outages with the use of a robotic demolition machine for tear-out and the Muck-it-Bucket for their skid-steer debris removal.

To ensure proper radial alignment of refractory to be installed, production managers should address where the brick begins its long journey up kiln. It may be an advantage to check the retaining ring to confirm it is set perpendicular to the kilns radial axis using the Radialign Laser. The advantage provided is simple, in the fact that when retaining rings are set correct, it will verify refractory being installed is perpendicular to the kiln's radius from the very first course of brick installed. The Radialign Laser System can check the retaining ring, and also be used so marks can be easily placed along the refractory path every 1.5-3m which provides the mason a point of verification to insure that refractory is perpendicular to the kilns radial axis throughout the entire length of installation, which is crucial to refractory longevity.

Refractory handling

Perhaps one issue not thought out as part of outages is the amount of refractory handling involved during kiln outage which in itself may cause refractory damage before it is installed. There are



Using the Radialign to mark and align the kiln for proper radial alignment of refractory when installation begins

many methods used in getting refractory to your bedding crew: passing brick to one another, gravity feed roller conveyors, belt conveyors – all of which must be hand loaded. Every move being made by these methods will create some form of damage to the refractory. Imagine setting a full pallet of refractory upon a cart that rides on tracks where it can transition under your bricking machine to the area being bedded out. The Port-A-Trac takes unnecessary handling of refractory out of the equation as it reaches the bedding crew. This allows work on the bricking machine in conjunction with the bedding crew so tops and bottoms will be installed together. No pre-stocking of bedding brick will decrease worker fatigue and this method is faster and safer than other methods.

Bricking machine selection

The most critical item for installation is the bricking machine. There are many things to consider: will the machine be custom-built for a specific kiln, or perhaps a generic machine built for many different diameter kilns? How difficult will it be to assemble within the kiln? With so many questions, a manufacturer that builds custom bricking machines to international safety, engineering and manufacturing standards and provides the most modern advances in refractory installation methods will give answers and solutions to any issues. This modern bricking machine will not only keep installation safe, but it is also the most efficient.

During outages, kiln maintenance or repairs does not have to be a big issue. By implementing new methods and equipment, advancing into the 21st century for refractory installation is easy.



Two-man safety inspection cage going into a kiln to inspect for repairs